

REMARKS

Reconsideration and allowance are respectfully requested.

Claims 2 and 3 were previously withdrawn. Only claims 4 and 11 are being examined.

Remarks Regarding Amendments:

The specification has been amended to correct three transpositions of numbers in table 2. In particular for lines corresponding to Comparative Experiment C and examples 8 and 9, the values for C2 and C3 were switched. This error is an obvious typographical error as can be concluded from the resulting polymer composition that could not be obtained with a C2/C3 ratio of, for example, 1139/836 (NL/g), but only with a ratio of 836/1139 (Comparative Experiment C of Table 2). These values, similarly switched for examples 8 and 9, are corrected in the instant amendment.

Claim 11 is amended to remove the phrases “a bridged or” and “unbridged” as requested by the Examiner on number paragraph 1 of the Office Action.

No new matter is added by these amendments to the specification and claims and entry of the Amendments is requested.

Remarks Regarding Claim Objections:

The Office Action alleged that the claims contain informality because of the phrases “a bridged or” and “an unbridged.” Applicants traverse.

Solely in an effort to expedite prosecution and following the Examiner's suggestion, Applicants have removed the objected to phrases. Thus, this objection is moot and its withdrawal is requested.

Remarks Regarding 35 U.S.C. §103:

Claims 4 and 11 stand rejected under 35 U.S.C. §103 as allegedly obvious in view of U.S. Patent 6,583,082 (referred to in the Office Action and herein as “Hoang”) and PCT Application WO 97/38019 (referred to in the Office Action and herein as “Gillis”). Applicants traverse.

In response, Applicant submit the declaration of Dr. Doremaele in support of our arguments for patentability.

The claimed invention is directed to a process for the preparation of ethylene/ α -olefin/vinyl norbornene in the presence of three components: (1) a catalyst composition comprising a Group IVB metallocene catalyst, (2) an aluminoxane activating compound and (3) 0 - 0.20 mol per mol of the catalyst of a further activating compound.

Applicants agree with the Examiner that Hoang does not teach the copolymerization of (1) ethylene (2) α -olefin and (3) vinyl norbornene. Further, the addition of Gillis to Hoang does not cure the defect of Hoang.

There is no motivation, provided in Hoang or Gillis to produce Applicants claimed invention since Gillis specifically teaches against the use of Applicant's claimed combination by stating "If the metallocene procatalyst is entirely one of formula $(Cp^1R^1_m)R^3_nY_rMX_8$, it is activated with the aforementioned cation-generating cocatalyst". (Page 13, lines 16-19 and page 12, line 23.) The cation-generating cocatalyst comprises a first, second and third component (page 18, lines 9-21), with a second component having at least one aryl group possessing at least one electron-withdrawing substituent (page 18, lines 17, 18). Since Hoang's aluminoxane cocatalyst does not fulfill these requirements, Gilles and Hoang teaches against the combination of the two references.

Furthermore, the claimed invention provides unexpected results over the prior art. Applicants refer the Examiner to Example 4 and Comparative Example C in the Specification. First, applicants would like to point out to the Examiner that the catalyst used in Example 4 and Comparative Example C are comparable. Example 4 and Comparative Example C in the '377 application are comparable because they used highly similar catalyst that are identical once they are in active form. The catalyst for Example 4 is η^5 -(perfluorophenylcyclopentadienyl)(tri-tert-butylphosphinimine)titanium **dimethyl**. The catalyst for Comparative Example 4 is η^5 -(perfluorophenylcyclopentadienyl)(tri-tert-butylphosphinimine)titanium **dichloride**. The only difference between the two catalysts is the methyl vs. chloride group in the activatable ligand. An activatable ligand is activatable because aluminoxane will activate

the catalyst by removing this ligand, thus creating an open site for C2, C3 or diene insertion. Once activated by aluminoxane or borate, the two catalysts are exactly the same. See attached Declaration, paragraph 9. This can also be learned from Hoang Col 7 lines 14 – 32, where Cl (line 24) and Me (line 20) are mentioned as “leaving ligands” and being considered as interchangeable (line 40). For this reason the organo-metallic compound is often referred to as “procatalyst”. See, Doremaele Declaration, paragraph 9.

As the Examiner indicated that the experimental conditions are different, Applicants submit that the dosed amounts of C2 and C3 have been interchanged. This obvious error could be concluded from the resulting polymer composition, that could not be obtained with a C2/C3 ratio of 1139/836 (NL/g), but only with a ratio of 836/1139 (NL/g). If this should still be not convincing one may compare Example 4 with Comparative Experiment A, in which the same catalyst precursor is used. See, Doremaele Declaration, paragraph 10.

Unexpected results are shown, at least, in the description at page 13, Example 4 verses comparative Experiment C. This section clearly shows that the polymerization of Example 4 according to the present invention allowed ten times more VNB than a polymerization in the presence of a borate co-catalyst to obtain the same amount of branching. See Doremaele Declaration, paragraph 11 Furthermore, Example 8 versus Comparative Experiment C shows that under similar conditions and the same amount of VNB incorporated, the MAO activated sample was hardly branched in terms of $\Delta\delta$, while the borate activated sample was highly branched in terms of $\Delta\delta$. See Doremaele Declaration, paragraph 12.

The purpose of the claimed invention was to build in a high amount of VNB for effective curing with peroxide. Contrary to Gillis, the purpose is not to built in VNB to increase the level of branching. without reactor fouling. Applicants' results, showing conditions allowing a 10 time more VNB without reactor fouling and without gelling and leading to a degree of branching comparable to that achieved with a ten fold lower amount of VNB are all unexpected. The highest amount of built in VNB in Gillis is

disclosed in Experiment 7, where 0.5 mL VNB is dosed. With a VNB density of 0.841 g/ml this corresponds to 0.42 gram VNB. Starting from the presumption that all VNB has been incorporated in 91 gram of polymer, this corresponds with at most 0.46 % VNB in the polymer. This result was not achieved by the prior art and would not be expected to be achieved without the experiments as outlined in the '377 application). See Doremaele Declaration, paragraph 14.

Furthermore, Applicants would like to address the Examiner's statement, on page 4 of the November 11, 2007 Office Action, which states that metallocene catalyst 2 with a polar perfluorophenyl substituent on the cyclopentadienyl ring is not representative of the metallocene catalyst of the instant claims. Applicants have reviewed the instant claim 11 as amended by the amendment of November 17, 2008 and determined that metallocene catalyst 2 is indeed a metallocene catalyst of the instant claim 11 Cp is a ligand selected from the group consisting of cyclopentadienyl, substituted cyclopentadienyl, indenyl, substituted indenyl, fluorenyl and substituted fluorenyl. A perfluorophenylCp ligand is an example of substituted cyclopentadienyl. It is clear that claim 11, in its current form, reads on metallocene catalyst 2. Therefore, Example 4 is commensurate with the scope of the instant claims. See attached Declaration, paragraph 15.

Example 3 shows that even with a very high dosing of VNB, no gelations occurs. Dosing more than 50 mmol/L VNB, which is an extremely high amount, shows higher long chain branching than Example 4 which has lower amounts of VNB dosing. However, Example 10 shows, that by reducing temperature and catalyst, the amount of branching can be brought back to the level of Example 4. Applicants note that these state of the art high amounts of VNB dosing were not possible at all without complete gelation prior to Applicant's invention. See attached Declaration, paragraph 13

Applicants would also like to address the Examiner's comment that Example 3 has a much lower $\Delta\delta$ of 1.5 compared to Example 4 with a $\Delta\delta$ of 9.0. The Examiner has alleged that the claimed process does not always produce the terpolymer with low level of long chain branching. Applicants note that "low level of long chain branching" is not part of the instant pending claim 4 or 11. The objects of the invention is to produce

a polymer with a high VNB content, to have a fast curable EPDM while avoiding gelation in the reactor. Although the degree of branching of Example 3 is higher than that of Example 4, the amount of build in VNB is also 20% higher. This represents a significant advantage as less peroxide is required for curing – thus reducing the overall cost of the process. See attached Declaration, paragraph 15.


Withdrawal of the Section 103 rejections is requested because the claims would not have been obvious to one of ordinary skill in the art when this invention was made and because the claimed process produced unexpected results that would not be expected from a combination of the cited references.

Conclusion

Having fully responded to the pending Office Action, Applicants submit that the claims are in condition for allowance and earnestly solicit an early Notice to that effect. The Examiner is invited to contact the undersigned if any further information is required.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: 

Eric Sinn

Reg. No. 40,177

901 North Glebe Road, 11th Floor
Arlington, VA 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100